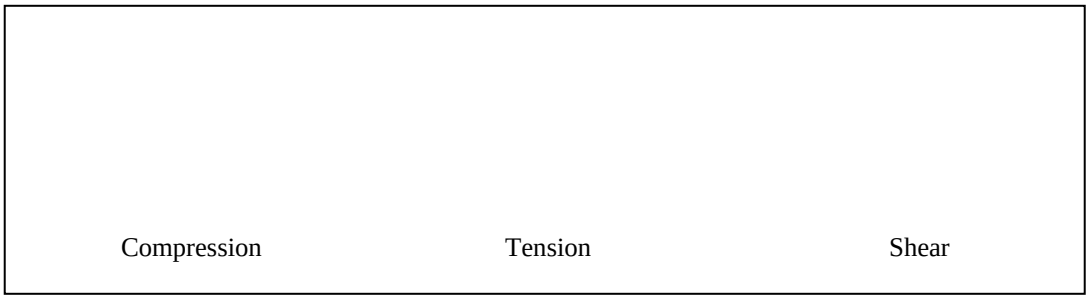
Structural Geology (Rock Deformation)

Stress & Strain

Stress == force (per unit area) on rock
Strain == response of rock (change in shape or volume, deformation)



Types of Strain (response to stress)

- Elastic – reversible, will "spring" back if elastic limit is not exceeded (Ex: rubber band, seismic waves thru rock)
- Ductile (plastic) – flows, deformation is permanent (no loss of cohesion) → folds (Ex: pipe cleaner, wire)
- Brittle – breaks, fractures (loss of cohesion)→ faults

Response of rx depends on…

1. Rock type (rigidity)
2. Temperature ($\propto$ depth)
3. Confining pressure (lithostatic pressure) :. $\propto$ depth
4. Rate of deformation (silly putty example)
5. Presence of water – wet rx more ductile

Earthquakes only in shallow crust where brittle fracture is possible.

Brittle Shear

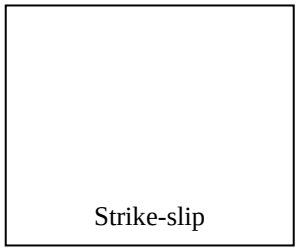
No deformation brittle deformation ductile deformation

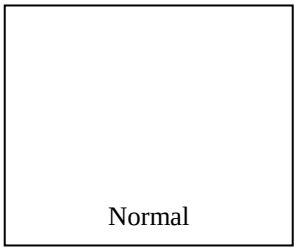
Maximum shear stress is at 45° angle.

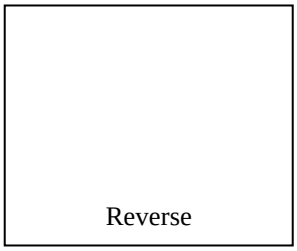
Rock's "angle of internal friction" makes fractures closer to 30° / 60°.

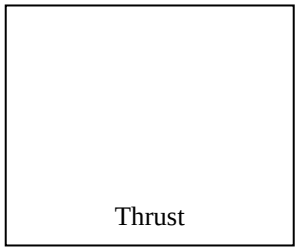
:. Joints and faults indicate the direction of maximum compressive stress.

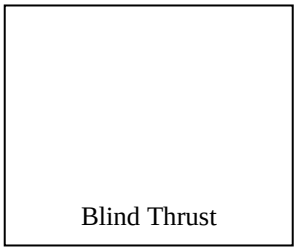
Faults (again)

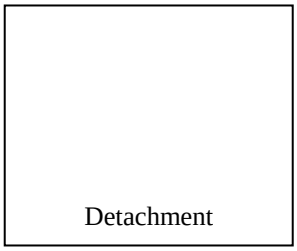

Strike-slip


Normal


Reverse


Thrust


Blind Thrust

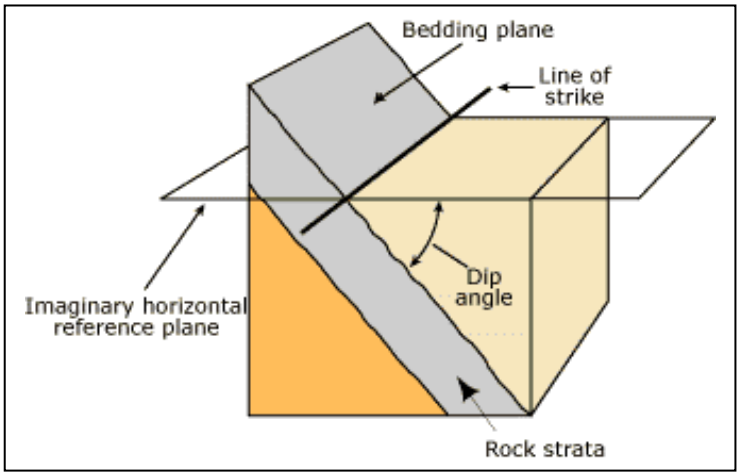

Detachment

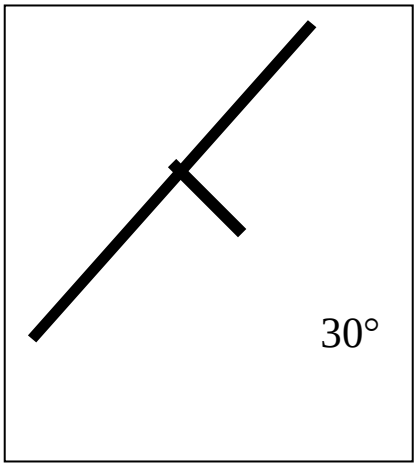
Footwall – the wall underfoot
Hanging wall – the wall “overhead”

Horst & graben (series of normal faults) Basin & Range

Thrust belts

Description of planar features (beds, faults, joints, etc.)





Description of folds (limbs, axial plane)

Anticline

Syncline

Monocline

Overturned

Recumbant

Plunging folds

Dome & Basin